Application No.: 10/757,689   2   Docket No.: 509982003101

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1-32 (Canceled)

Claim 33 (Previously Presented): A method of designing underlying structures in a wafer that balances planarization and optical metrology characteristics, the method comprising:

fabricating a plurality of underlying structures of varying size and/or shape;

comparing planarization characteristics of the underlying layers of the wafer to preset standard planarization characteristics;

fabricating one or more target structures in the target layer of the wafer;

measuring a reflected metrology signal off a target structure fabricated above a calibration test area of the target layer of the wafer to obtain a calibration metrology signal, the calibration test area having an unpatterned underlying structure; and

selecting an underlying structure from the plurality of underlying structures that yields a reflected metrology signal off the target structure above a patterned area that is closest to the calibration metrology signal, the selected underlying structure having planarized layers that meet the preset standard planarization characteristics.

Claim 34 (Previously Presented): The method of Claim 33 wherein the planarization characteristics of the planarized layers of the wafer comprises measurements of extent of erosion and/or dishing of materials of the planarized layers of the wafer.

Claim 35 (Previously Presented): The method of Claim 33 wherein the plurality of underlying structures have a loading factor, the loading factor being the ratio of area occupied by one or more shapes to the area occupied by both the one or more shapes and spaces.

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Claim 36 (Previously Presented): The method of Claim 35 wherein the one or more shapes include pads with geometric shapes.

Claim 37 (Previously Presented): The method of Claim 35 wherein the one or more shapes include pads with irregular shapes.

Claim 38 (Previously Presented): The method of Claim 33 wherein the one or more shapes include geometric shapes positioned in a random manner.

Claim 39 (Previously Presented): The method of Claim 33 wherein the plurality of underlying structures in the wafer includes an underlying periodic structure, the periodicity of the underlying periodic structure being positioned at an angle relative to the direction of periodicity of the target structure of the wafer.

Claim 40 (Previously Presented): The method of Claim 33 wherein the one or more underlying structure in the wafer includes a first layer of underlying periodic structure and a second layer of underlying periodic structure, the periodicity of the first layer of underlying periodic structure and the second layer of underlying periodic structure being positioned perpendicular to the direction of periodicity of the target structure of the wafer.

Claim 41 (Previously Presented): The method of Claim 40 wherein the second layer of underlying periodic structure includes lines and spaces, the spaces being optically transparent to metrology signals.

Claim 42 (Previously Presented): The method of Claim 41 wherein the second layer of the underlying periodic structure comprises lines and spaces and the line-to-space ratio ranges from 0.10 to 0.60.

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Claim 43 (Previously Presented): The method of Claim 41 wherein the number of spaces of the second layer of the underlying structure is 2, 4, or 6.

Claim 44 (Previously Presented): The method of Claim 33 wherein the target structure is fabricated using a single damascene lithographic and etch process.

Claim 45 (Previously Presented): The method of Claim 33 wherein the target structure is fabricated using a dual damascene lithographic and etch process.

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